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SUBJECT: Authorization for Release of Technical Information, Control Number: **AFRL-PR-ED-AB-2002-148**
Ron Bates (PRSA) et al., "Heat Transfer and Deposition Behavior of Hydrocarbon Rocket Fuels"
(abstract only)

Aerospace Sciences Conference **(Statement A)**
(Reno, NV, 6-9 January 2003) (Deadline = 28 June 2002)

Heat Transfer and Deposition Behavior of Hydrocarbon Rocket Fuels

As the desire to increase the performance of hydrocarbon/liquid oxygen rocket engines naturally leads to increased combustion chamber pressures and higher energy hydrocarbon fuels, the combustion chamber and nozzle heat fluxes also increase. For engines regeneratively cooled with hydrocarbon fuel, this additional thermal stress must be effectively carried by the fuel without degradation of the cooling channel surfaces. A methodology for evaluation of the thermal performance (thermal stability and heat transfer characteristics) of hydrocarbon rocket fuels is suggested. As part of that methodology, an experimental research program to investigate the thermal performance of several new candidate hydrocarbon rocket fuels has been started. The experimental program utilizes a series of test rigs of increasing complexity and fidelity to successively screen identified fuels without the cost and complexity of a full engine system level test. Results of small-scale thermal decomposition experiments utilizing a System for Thermal Decomposition Studies (STDS) test rig provide an initial evaluation of the thermal stability performance of fuels from very small fuel samples. Measurements of heat transfer coefficient and the effect of wall temperature, flow velocity, and wetted-material on deposit formation in heated test channels are obtained from larger rigs, such as the NASA/GRC Heated Tube Facility and the AFRL/PRS High Heat Flux Facility. Representative results from early testing will be presented to illustrate the effectiveness of the overall approach.